Application No. 09/589,299
Filed: June 7, 2000
TC Art Unit: 2675
Confirmation No.: 9186

REMARKS

A. Independent claim 1 and claims dependent therefrom.

Claims 1-7, 9-11, 28-29, and 37 have been rejected under 35 U.S.C. § 103(a) over Amafuji et al. (US 6,292,158 B1) in view of Rallison et al. (US 5,949,583). Reconsideration of this rejection is respectfully requested.

Amafuji has been cited for disclosing a compact display device 201 for transmitting an image to a user's eye. Amafuji discloses an off-axis optical system. Rallison has been cited for teaching an on-axis or axial optical system. The Examiner asserts that it would be obvious to combine the on-axis or axial system of Rallison with Amafuji, the motivation being to provide a head mounted display (HMD) that produces virtual images with a minimal amount of aberrations, therefore allowing for better image quality and light efficiency. (Final Office Action, page 3)

In response to Applicant's arguments, the Examiner states (at pages 22-23 of the Final Office Action):

> The examiner is not using the entire system, i.e. goggles etc., of Rallison but only the on-axis part to replace the off-axis system of Amafuji. Thus it would be obvious since both references pertain to a head mounted display they can be used with each other and in this case that is the purpose by replacing the off-axis system of Amafuji with the on-axis system of Rallison.

Thus, the Examiner asserts that the off-axis system of Amafuji is "replaced" with the on-axis system of Rallison.

Applicant respectfully submits that such a "replacement" would not be obvious. Substantial reconstruction would be required to effect such a replacement. Furthermore, it is not clear what structural form such a replacement would take.

Application No. 09/589,299
Filed: June 7, 2000
TC Art Unit: 2675
Confirmation No.: 9186

An axial system requires an eyepiece in front of the face. Such a system is generally characterized by more weight suspended in front of the face. If the weight is high, the center of gravity (CG) is located too far forward, which is a problem. It also might present a safety hazard to the eye. A non-axial system such as that of Amafuji obviates these problems. In a non-axial system, the optically complex system is moved away from the face. However, it is found in practice that the total weight of such a system is still high. Also, despite the center of gravity disadvantages, axial systems have far less distortion than non-axial systems.

The present invention provides an axial system that reduces the total weight, which is not an obvious task. Claim 1 recites a head-mountable support fixture comprising an elongated member having a first end and a second end. The projection system is attached at the first end of the elongated member of the support fixture and that the eyepiece assembly is attached to the second end of the elongated member of the support fixture.

The Examiner asserts that the non-axial system of Amafuji is "replaced" with the axial system of Rallison. The Rallison axial system, however, does not employ an elongated member having a projection system attached at one end and an eyepiece assembly attached at an opposite end, as the Examiner acknowledges (Final Office Action, p. 23). The Examiner does not, however, explain how the Rallison axial system would be employed in the Fig. 5 embodiment of Amafuji, other than by a "replacement." On this detail, the Examiner is silent.

More particularly, Rallison discloses an image generator 2 mounted in a visor arrangement to extend outwardly from the forehead area of the wearer. See Figs. 3 and 4. An optical path 6

from the image generator extends downwardly to a fold mirror 1 and outwardly to a reflective combiner 4, where it is then reflected back toward the eye. One of skill in the art would not try to rearrange the optical components of Rallison to place the image generator on one end of an elongated member and the optical components on the other end or to fit these components into the embodiment of Amafuji's Fig. 5, which is mounted on the side of the user's head. There is no teaching in Amafuji or Rallison as to how one of skill in the art would modify the Fig. 5 embodiment of Amafuji into an axial system. In any event, substantial reconstruction would be required to do so, more than a mere "replacement." Accordingly, claim 1 and the claims dependent therefrom are believed to be patentable over Amafuji in view of Rallison.

B. Independent claim 13 and the claims dependent therefrom.

Claims 13, 19, 28-29, and 40 have been rejected under § 103(a) over Amafuji and Rallison in view of Ronzani and further in view of Robertson et al. (US 6,034,653). Reconsideration of this rejection is respectfully requested.

Ronzani has been cited (in the rejection of dependent claim 12) for disclosing a HMD display in which the eyepiece assembly is "hollow and spherical and therefore curved." Ronzani, however, does not disclose a spherical eyepiece assembly. As is apparent from Figs. 1-9 of Ronzani (cited by the Examiner), Ronzani discloses an eyepiece or cell 3 that is housed in a cylindrical housing.

Despite this clear disclosure, the Examiner maintains that Ronzani discloses a spherical eyepiece assembly. The Examiner

states: "Firstly, the applicant may interpret the Ronzani as disclosing a housing as being cylindrical, however, the examiner interprets it [to] be spherical because it still has a spherical shape." (Final Office Action, page 24)

The Examiner is incorrect. A sphere and a cylinder are different. A claim must be given its broadest reasonable interpretation. To read a "spherical" housing on a "cylindrical" housing is not a reasonable interpretation of the claim.

In Applicant's invention, the curved surfaces provided by the spherical nature of the eyepiece provide safety advantages not provided by the edges formed by the cylindrical housing of Ronzani. Also, the spherical housing enables further integration of the housing and the optical functions, which saves weight and cost.

In Ronzani, the cylindrical shape allows the use of off-the-shelf lens tubes and round lenses. Ronzani provides no teaching to integrate both the housing and the optics into a spherical shape to improve safety, improve optics, or lower weight. Also, in Ronzani, the LCD (the display) is inside the cylinder, whereas in the present invention, the projection system including display is attached at the other end of a support fixture from the eyepiece. Thus, Ronzani is a substantially different device, and the manner in which it could be combined with the other prior art references cited by the Examiner is not clear.

Robertson is cited for disclosing a pod 330 that can be made of a display 332 and transparent window 335. The Examiner maintains that, if one side of the pod has a transparent window, it would be obvious that "the pod can be made to be entirely of a

transparent material or half or to what is desired." (Final Office Action, page 24)

Robertson does not disclose, teach, or suggest a transparent housing. The window 335 of Robertson is not a housing. There is no indication that the housing in Robertson could be transparent, and there is no apparent basis in the prior art of record for the Examiner's assertion that a housing could be made of a transparent material merely because there is a window in that housing. The use of the housing itself as the window or optical element is not shown in the prior art of record.

In the present invention, the transparent housing performs both optical and mechanical functions, which also leads to a reduction in weight and number of parts. There is no teaching in Robertson or Ronzani to combine both optical and mechanical functions by employing a transparent housing.

Accordingly, claim 13 and the claims dependent therefrom are believed to be patentable over Amafuji, Rallison, and Ronzani in view of Robertson.

The Examiner also asserts that the disparate variety of four different eyepiece assemblies (Amafuji, Rallison, Ronzani, and Robertson) can be combined to arrive at the presently claimed invention merely because "they are all related to one another because they are all head mounted displays" (Final Office Action, page 25). The Examiner's asserted motivation is conclusory and lacks support from the references themselves. Furthermore, the mere fact that the references can be combined does not mean that it would be obvious to do so. The references must be considered in their entirety. Merely because the references are in a similar field does not, in itself, provide a motivation to combine without

WEINGARTEN, SCHURGIN,
GAGNEBIN & LEBOVICI LLP
TEL. (617) 542-2290

consideration of what the references actually teach and how they would be combined. Thus, claim 13 and the claims dependent therefrom are believed to be patentable over Amafuji in view of Rallison, Ronzani, and Robertson.

C. Independent claim 21 and the claims dependent therefrom.

Claims 21-25, 28-29, and 43 have been rejected under § 103(a) over Amafuji in view of Uehara et al. (US 6,243,208 B1). Reconsideration and withdrawal of this rejection is respectfully requested for the following reasons.

Amafuji has been cited for disclosing a compact display device 201 for transmitting an image to a user's eye. Uehara has been cited for teaching an image system B1 that has a material of external surfaces and internal reflecting surfaces and in which light refracts as it enters and exits the system and reflects throughout the system. The Examiner asserts that it would have been obvious to combine the image display of Uehara with the image display of Amafuji. The Examiner asserts that a suggestion or motivation for making this combination is to provide a better eye assembly for producing more efficient images that would entitle the image to have higher contrast, resolution, luminance and cleanliness. (Final Office Action, page 11) The Examiner also states that even though Uehara can be used in a video camera, it would be obvious that a HMD is very closely related to video cameras. (Final Office Action, page 25)

Applicant respectfully disagrees that it would be obvious to combine Uehara with Amafuji. The Examiner's assertion that a head mounted display is "very closely related" to a video camera is overly generalized. The references must be considered in their

entirety, which includes an examination of the actual teachings of the references.

Uehara relates to a complex optical system for use with devices such as a video camera, still video camera, copying machine and the like. (Col. 1, lines 8-12; col. 11, lines 27-34) In Uehara, light enters the optical element B1 from one refracting surface and leaves from another refracting surface after it is repetitively reflected by a plurality of reflecting surfaces. (Col. 5, lines 37-44) The purpose of the optical element B1 is to gather light and transmit it to an image sensing element 3, such as a CCD or the like. (Fig. 1; col. 10, lines 53-55) The optical element of Uehara does not "have any symmetrical axis like an optical axis in a normal optical system." (Col. 7, lines 22-24) Uehara also states: "Since the optical system of the present invention is a decentered optical system, the individual surfaces that build the optical system do not have any common optical axis." (Col. 8, lines 42-44) Furthermore, the optical element B1 is coupled to a holding member and is attached to be movable with respect to a main body, thus incorporating a zoom function into the video camera, copying machine, or the like. (Col. 11, lines 27-34) Toward this end, the optical element B1 includes a reference portion 7 for coupling to the holding member.

Amafuji relates to a different device, used for a different purpose. Amafuji is not gathering light to direct it to an image sensing element of the type used in a video camera or copying machine. Rather, Amafuji relates to a device that displays an already-generated image and transmits that display to an eye of a user. The optical components of Amafuji do not need the various refracting and reflecting optical surfaces that are needed in

Uehara. Nor is there a need in Amafuji for an optical element having a zoom function or optical reference portions for coupling to a holding member.

Also, Amafuji discloses an off-axis optical system. In contrast, the optical element of Uehara does not "have any symmetrical axis like an optical axis in a normal optical system." (Col. 7, lines 22-24) Uehara also states: "Since the optical system of the present invention is a decentered optical system, the individual surfaces that build the optical system do not have any common optical axis." (Col. 8, lines 42-44) Thus, one of skill in the art would not incorporate the complex optical system of Uehara into a head-mounted display, such as Amafuji. Further, it is not clear how the off-axis system of Amafuji and the decentered system of Uehara would even be combined.

The Examiner's asserted motivation of providing a better eye assembly for producing more efficient images that would entitle the image to have higher contrast, resolution, luminance and cleanliness does not take into account the teachings of the references in their entirety. Without more, such a motivation could advantageously apply to any optical device. However, there is nothing in Amafuji or Uehara to suggest that their specific combination would be able to achieve this result, and there is much in these two references that would not suggest that one of skill in the art make this combination.

Accordingly, claim 21 and the claims dependent therefrom are believed to be patentable over Amafuji in view of Uehara.

D. Remaining dependent claims.

Claim 8 has been rejected under § 103(a) over Amafuji and Rallison and further in view of Taniguchi et al. (US 6,023,253). This claim is believed to be patentable for the reason set forth with respect to claim 1 and no further comment thereon is believed necessary at this time.

Claim 12 has been rejected under § 103(a) over Amafuji and Rallison and further in view of Ronzani et al. (US 5,844,656). This claim is believed to be patentable for the reason set forth with respect to claim 1 and no further comment thereon is believed necessary at this time.

Claims 14 and 15 have been rejected under § 103(a) over Amafuji, Rallison, Ronzani and Robertson and further in view of Taniguchi (US 6,023,253). These claims are believed to be patentable for the reason set forth with respect to claim 13 and no further comment thereon is believed necessary at this time.

Claims 16-18 and 20 have been rejected under § 103(a) over Amafuji, Rallison, Ronzani and Robertson and further in view of Fan et al. (US 5,815,126). These claims are believed to be patentable for the reason set forth with respect to claim 13 and no further comment thereon is believed necessary at this time.

Claims 26-27 have been rejected under § 103(a) over Amafuji and Uehara and further in view of Ronzani. These claims are believed to be patentable for the reasons set forth above with respect to claim 21, and no further comment thereon is believed necessary at this time.

Claims 30-32 have been rejected under § 103(a) over Amafuji and Rallison in view of Lebby et al. (US 5,469,185). Claims 30-32 have also been rejected under § 103(a) over Amafuji, Rallison,

Ronzani, Robertson, and Uehara in view of Lebby. Claims 30-32 have further been rejected under § 103(a) over Amafuji, Rallison and Uehara in view of Lebby. These claims are believed to be patentable for the reasons set forth above with respect to claims 1, 13, or 21, and no further comment thereon is believed necessary at this time.

Claims 33-35 have been rejected under § 103(a) over Amafuji and Rallison in view of Fan et al. (US Pat. No. 5,815,126). Claims 33-35 have also been rejected under § 103(a) over Amafuji, Rallison, Ronzani, Robertson and Uehara in view of Fan. Claims 33-35 have been further rejected under § 103(a) over Amafuji and Uehara in view of Fan. These claims are believed to be patentable for the reasons set forth above with respect to claims 1, 13, or 21, and no further comment thereon is believed necessary at this time.

Claim 36 has been rejected under § 103(a) over Amafuji and Rallison in view of Newman et al. (US 5,844,824). This claim is believed to be patentable for the reasons set forth above with respect to claim 1, and no further comment thereon is believed necessary at this time.

Claim 38 has been rejected under § 103(a) over Amafuji and Rallison in view of Horiuchi (US 6,304,234 B1). This claim is believed to be patentable for the reasons set forth above with respect to claim 1, and no further comment thereon is believed necessary at this time.

Claim 39 has been rejected under § 103(a) over Amafuji, Rallison, Ronzani and Robertson in view of Newman. This claim is believed to be patentable for the reasons set forth above with

respect to claim 13, and no further comment thereon is believed necessary at this time.

Claim 41 has been rejected under § 103(a) over Amafuji, Rallison, Ronzani, and Robertson in view of Horiuchi. This claim is believed to be patentable for the reasons set forth above with respect to claim 13, and no further comment thereon is believed necessary at this time.

Claim 42 has been rejected under § 103(a) over Amafuji and Uehara in view of Newman. This claim is believed to be patentable for the reasons set forth above with respect to claim 21, and no further comment thereon is believed necessary at this time.

Claim 44 has been rejected under § 103(a) over Amafuji and Uehara in view of Horiuchi. This claim is believed to be patentable for the reasons set forth above with respect to claim 21, and no further comment thereon is believed necessary at this time.

Application No. 09/589,299
Filed: June 7, 2000
TC Art Unit: 2675
Confirmation No.: 9186

E. Conclusion

In view of the above amendments and remarks, all claims are believed to be in condition for allowance, and reconsideration and indication thereof are respectfully requested. The Examiner is encouraged to telephone the undersigned attorney to discuss any matter that would expedite allowance of the present application.

Respectfully submitted,

MARK B. SPITZER

By: _____
Beverly E. Hjorth
Registration No. 32,033
Attorney for Applicant

WEINGARTEN, SCHURGIN,
GAGNEBIN & LEBOVICI LLP
Ten Post Office Square
Boston, MA 02109
Telephone: (617) 542-2290
Telecopier: (617) 451-0313

BEH/dkh/305921